IoT based Implementation of Vehicle Monitoring and Tracking system using Node MCU

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Abstract: In this paper, vehicle monitoring and tracking systems are implemented using Blynk platform acting as a medium for data transfer and visualization. The system is developed to monitor various driver help parameters like eye blinking, alcohol consumption and vehicle parameters like engine temperature, the distance between the vehicles and tracking of the live location of the Vehicle. The Ultrasonic sensor is placed in the front part of the vehicle, if any two vehicles draw near to one another then an alert message is sent to the mail through Blynk application. The Temperature sensor is placed in the engine part. When the temperature raise's in the engine, caution is sent to the mail. Eye-blink sensor and alcohol sensor are utilized to check the condition of the driver, if the state of the driver is abnormal then a notification is sent to mail. The developed system takes care of vehicles and driver’s safety.

Keywords: Blynk, Cloud, GPS, Sensors.

I. INTRODUCTION

Internet of Things (IoT) is nothing but the devices (things) communicating with each other by using the internet. IoT is a trend-setting innovation in which all the data from sensors is stored in the cloud where it can be easily accessed from the cloud. Sensors and actuators for gathering the data and sending across the internet are also included in this advancement. We use cloud not only to store data but also for data analysis, gathering, visualization. The key characteristics of cloud include on-demand service provision, resource pooling and elasticity. Internet of Things (IoT) means communicating of devices with each other over the internet. Some applications of IoT are Smart energy, smart city health monitoring system. In IoT data is transmitted from sensors and they can be stored and analyzed by diverse IoT platforms like Blynk, Thinger.io, Thingspeak. In the present situation no less than one individual in the family has a vehicle. In the present age everybody inclination is changing regarding time, and they have to complete their works in restricted time, so the need to complete the work as fast as possible, because of that tendency they drive the vehicles very fast risking their lives in order to complete their work resulting to the cost of their life’s. In some cases without the intervention of us even we may fall to accidents due to others fault. In this present age the vast majority of them surmise that driving quick is form and those individuals think it is an exciting driving quick, yet they couldn't comprehend that it is the greatest hazard that may risk to their lives. Despite with part of checking’s a few people still take liquor and drive it prompts peril, it isn't protected to the general population and furthermore to the people in the vehicle. Due to over endure their work or having less rest hours may likewise prompt laziness and because of that the individual who is driving the vehicle may fall. Rest or close the eyes for quite a while that may prompts deadly accidents. In few cases the temperature in the motor turns out to be high because of more warmth in the environment or because of loss of coolant these are the most widely recognized issues for the warmth in the engine. Most of the accidents occur because of not maintaining a proper distance between them this is also a serious problem that to be considered, to overcome these issues we had planned a vehicle observing and controlling framework, in that we have utilized distinctive sensors and gathered data from every sensor and data is analyzed using Blynk Application, and we had utilized a GPS module to track the data and here the microcontroller we have used is NodeMCU.

II. LITERATURE REVIEW

Das et al[1] proposed a vehicle accident and location monitoring system. This system provides a mechanism to reduce disasters by monitoring eye blinking of the driver, which indicates drowsiness, obstacles located in the road and the drunken state of the driver. Accident and the location of the vehicle are detected. By this system primary care is received as the accident information is available Anusha et al[2] implemented a system using LPC2148 and the system has features like storing in the database. The work includes GPS, GSM modules. The framework also detects Alcohol consumption and Engine Temperature. All the values can be seen on the Web page so safety is provided to the travelers in the vehicle. Imteaj et al[3] developed an Android-based application that detects an accidental situation and sends an alert message to the nearest police station and medical care center. This application is organized with an external pressure sensor to extract the outward force of the vehicle body. Hence, the application plays an important role in Post-accident services and could lessen the effect due to an accident Mayuresh et al[4] described a system that uses an open source platform and intended to monitor and trace the location of a vehicle, the framework also checks fuel consumption, engine
temperature and vehicle speed, GPS/GPRS/GSM modules are used for communication. All the values are stored in the database on the web server.

Prasanth et al[5] are designed and implemented a model that is based on Raspberry Pi and a smartphone android application. The system mainly comprises of three things GPS/GPRS/GSM SIM 900A. The entire setup is placed inside the vehicle. GPRS sends the information to the server and GSM is used for sending the alert messages to the vehicle mobile owner.

Manali et al[6] proposed a system that has an Android mobile assembled with GPS and GSM modules along with a processor that is setup in the vehicle. During the movement of the vehicle, the location of the vehicle is continuously observed in the web server using GPRS. Harum et al[7] suggested a framework that is based on Raspberry Pi that is connected to 3G/4G dongle used as a Modem. The vehicle unit is attached to the vehicle, the attached unit is configured to receive signals from a mobile tower and send it to web server to represent the location on the map in the real time.

Navod et al[8] designed and implemented vehicle tracking, vehicle monitoring, controlling and vehicle status. In this system vehicle door, parking lights, side mirrors are monitored and controlled by a mobilephone.

III. VEHICLE MONITORING AND TRACKING SYSTEM

The vehicle monitoring and tracking system have been developed in this paper. An ultrasonic sensor is placed in the front part of the vehicle, if any vehicle draws near then alert message is sent to the mail via Blynk application. To avoid the sparks in the vehicle temperature sensor is utilized and it is placed in the engine part of the vehicle if the temperature inside the car increases then Notification is sent to mail through Blynk. If alcohol consumption is in high range then caution will be sent. If the person feels drowsiness then it is detected by IR sensor and alarm will be in on state and an alert is sent to mail saying the driver is in the drowsy state. The values of all the sensors are collected by NodeMCU as it has inbuilt Wi-Fi module all the data is transferred to the cloud through Wi-Fi and analysis is done in Blynk app and notifications are sent according to the conditions.

Fig. 1 represents an overview of the proposed system

Sensor:
Choosing a sensor is a difficult task, according to the application requirements we have to choose sensors, if the system has to sustain for long time sensors should work accurately, they should be reliable

Ultrasonic sensor:
Here ultrasonic sensor is used, the reason behind choosing ultrasonic sensor its operation is not affected by sunlight, it has high accuracy rate and stable readings, It is used to detect an obstacle that is near to the vehicle. The sensor used in this prototype model ranges from 2cm–400cm. Ultrasonic sensor mainly comprises of four pins VCC, GND, Echo, Trigger, VCC supply for ultrasonic sensor is usually 5V, GND pin is connected to the ground of the Node MCU, The trig and echo pins are connected to the digital i/o pins on the Arduino board. To generate the ultrasound, you need to set the trig on a high state and the generated sound will be received by the echo pin.

Fig. 2. Picture of Ultrasonic sensor

We can calculate the distance between the two vehicles by using the formula
Distance=(0.034 *time)/2

Gas Sensor:
Here mq3 gas sensor is used, in particular in using mq3 sensor is its conductivity increase as the concentration of alcohol increases, it has high sensitivity and fast response rate.

Gas sensor mainly comprises of four pins, where three pins are used A0, GND, VCC, A0 is analog pin that is connected to analog pin of Node MCU, GND is connected to GND, VCC supply is 3.3v.

Fig 3: Picture of MQ3 sensor

IR Sensor:
IR sensor mainly consists of three pins VCC, GND, Digital pin The power supply for IR sensor is 3.3v and the GND pin of a sensor is connected to GND pin of Node MCU, the digital pin of IR sensor to digital pin of Node MCU

Fig4: Picture of IR Sensor
Temperature sensor:

DHT11 Sensor is used to check the engine temperature. DHT11 sensor consists of three pins, power supply of dht11 is 3.3v, GND pin is connected to GND pin of NodeMCU, Digital pin of dht11 sensor is connected to Digital pin of NodeMCU.

NodeMCU:
The Node MicroController Unit (NodeMCU) is used as a gateway. It has built-in Wi-Fi module which is used to send the sensor data to cloud for storage and analysis. The main reason behind selecting NodeMCU is that the sensors used in our project uses only digital pins and one analog pin are required. Also, it consumes less power (3.3v) and is of low cost when compared to other micro controllers/processors like Arduino and Raspberry pi. Node MCU is connected to ultrasonic sensors, gas sensor, temperature sensor, IR sensor. All the values are connected and send to Cloud server.

GPS Module:
Node MCU is ESP8266 based advancement board. It highlights ESP12E as its handling center. It is a 32bit MCU. It has 14 GPIO pins, single channel 10 bit coordinated ADC. It bolsters UART, 12C, SPI correspondence. It is 3.3V perfect event that you are new to Node MCU at that point read our Getting Started with Node MCU.
It has four pins VCC, GND, Tx, Rx

Blynk Platform:
Blynk can control hardware remotely. It can display sensor data, visualize. The three main components of Blynk are Blynk server, Blynk libraries, Blynk app. Using Blynk app we can create different widgets according to the requirements. Blynk server is responsible for the communication between hardware and the smartphone.
Features of Blynk platform:
1. Can connect cloud using WIFI, Bluetooth, USB, GSM
2. Easy to use Widgets
3. Emails, twitter, notifications can be sent
The project should be created in the Blynk after installation and with a particular id project should be created. Then a key is generated to the given mail id and with that particular key hardware can be connected to the cloud platform.

Fig 8: picture representing Blynk application

There are many widgets in the Blynk application. Each widget has its own settings and the widgets are the button, value, slider, timer, joystick, maps.

Fig 9: Image of widgets

Selection of pins is important in the widget. There is Digital pin, Virtual pin and Analog pin, a particular frequency can be selected. We can select on the play button and run the project.

Fig 10: Picture representing widget in Blynk app

All the values of the sensors are collected by NodeMCU and are sent to Blynk application.

Fig 11: Set up of Vehicle monitoring and tracking setup

The location details, temperature conditions, and the alcohol values and state of the person are displayed on the serial monitor, the values of the sensors exceed then notification message will be displayed on the serial monitor.

Fig 12: screenshots representing the values and the message displayed on the serial monitor

Fig 13: values displayed on the Blynk application and live location of the Vehicle is displayed on the Blynk

IV. RESULT AND DISCUSSION

Experimental Setup:
Fig 14: Screenshots showing the alert messages to the email about the state of the driver

V. CONCLUSION

Implementation of Vehicle Monitoring and Tracking system is implemented using Ultrasonic sensor, Gas sensor, IR sensor, Temperature sensor, GPS Module to increase the safety of the driver and to avoid accidents. By using this system constant checking of the driver and also the conditions of the car is checked and also the location of the vehicle is traced. The driver or the person in the car is alerted by the mobile application. The system is cost-effective, dynamic and efficient.

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